We Claim:

1. An *in vitro* system comprising a Notch ligand that supports T cell lymphopoiesis but does not support B cell lymphopoiesis.

2. An *in vitro* system of claim 1 comprising a Notch ligand that induces T cell lineage commitment and differentiation, stage-specific progenitor expansion, TCR gene rearrangement, and T cell differentiation by hematopoietic progenitors and embryonic stem cells in the absence of the thymus.

3. An *in vitro* system of claim 1 comprising a cell preparation comprising cells that express a Notch ligand.

4. An *in vitro* system of claim 3 that induces TCR V(D)J rearrangement, and T cell differentiation by hematopoietic progenitor cells or embryonic stem cells.

5. An *in vitro* system as claimed in claim 3 wherein the cell preparation comprises stromal cells that express a Notch ligand.

6. An *in vitro* system as claimed in claim 5 wherein the Notch ligand is a member of the Delta family.

7. An *in vitro* system as claimed in claim 6 wherein the Notch ligand is Delta-like 1 or Delta-like-4.

8. An *in vitro* system as claims in claim 3 wherein the cells lack functional macrophage colony stimulating factor (M-CSF).

9. An *in vitro* system as claimed in claim 5 wherein the stromal cells are OP9 cells.

10. An *in vitro* system as claimed in claim 9 wherein the OP9 cells comprise a Delta-like-1 nucleic acid sequence shown in SEQ ID NO:8 or SEQ ID NO:9.

11. An *in vitro* system as claimed in claim 9 wherein the OP9 cells comprise a Delta-like-4 nucleic acid sequence shown in SEQ ID NO:10 or SEQ ID NO:11.

12. A method of forming cells of the T cell lineage comprising culturing cells that are capable of differentiating into cells of the T cell lineage with an *in vitro* system of claim 1 to form cells of the T cell lineage.

13. A method according to claim 12 wherein the cells that are capable of differentiating into cells of the T lineage are selected from hematopoietic progenitor cells, hematopoietic stem cells and embryonic stem cells.

14. A method of claim 12 further comprising separating the cells of the T cell lineage to obtain populations of cells largely consisting of one or more types of cells of the T cell lineage.

15. A method of claim 14 wherein the population of cells that is separated comprises immature T cells.

16. A method of claim 14 further comprising inducing the immature T cells to form mature T cells.

17. A method of claim 14 wherein the population of cells are formulated in a pharmaceutically acceptable carrier, auxiliary or excipient.

18. A T cell lineage composition comprising cells of the T cell lineage generated with

a system as claimed in claim 1 .

19. A T cell lineage composition produced by culturing cells capable of differentiating into cells of the T cell lineage with a system of claim 1 and isolating cells of the T cell lineage in the culture.

20. A T cell lineage composition of claim 19 comprising one or more of:

(a) progenitor or precursor cells committed to the T cell lineage;

(b) $CD4^-$ $CD8^-$ $CD25^+$ $CD44^{\pm}$;

(c) cells that have undergone CD4 or CD8 lineage commitment;

(d) precursor thymocytes that are $CD4^+CD8^+$ double positive (DP);

(e) single positive cells that are $CD4^-CD8^+$ or $CD4^+CD8^-$ and optionally TCR^{hi};

(f) TCR-$\alpha\beta^+$ and/or TCR-$\gamma\delta^+$ T cells;

(g) $CD3^+CD90^+$; and

(h) mature and functional T cells characterized as TCR/$CD3^{high}CD4^-CD8^+$ or $CD4^+CD8^-$.

21. A composition which comprises a nutrient medium that has been conditioned by exposure to a Notch ligand cell preparation that supports T cell lymphopoiesis but does not support B cell lymphopoiesis.

22. A method for expanding cells of the T cell lineage comprising (a) culturing cells capable of differentiating into cells of the T cell lineage with a system of claim 1; and (b) isolating increased numbers of cells of the T cell lineage.

23. An expanded cellular composition comprising cells of the T cell lineage obtained by a method of claim 22.

24. A method as claimed in claim 23 wherein the number of cells is increased by at

least about 10 to 15 fold.

25. A pharmaceutical composition comprising cells of the T cell lineage generated with a system of claim 1 and a pharmaceutically acceptable carrier, excipient, or diluent.

26. A method for screening for modulators of cells of the T cell lineage comprising the steps of:

(a) generating cells of the T cell lineage with a system as claimed in claim 1 in the presence of a test substance; and

(b) detecting the presence or absence of an effect of the test substance on the survival of the cells or on a morphological, functional or physiological characteristic and/or molecular biological property of said cells, whereby an effect altering cell survival, a morphological, functional, or physiological characteristic and/or a molecular biological property of the cells indicates the activity of the test substance.

27. A method of treating a patient with a condition involving cells of the T cell lineage or requiring replacement of cells of the T cell lineage comprising transferring a T cell lineage composition as claimed claim 18 into the patient.

28. A method according to claim 27 to treat a patient with a T cell deficiency.